

## SECTION 7.51 UNDERDRAIN AND OUTLETS

**7.51.01--Description:** Underdrains shall consist of pipe pervious to water, laid in a trench refilled with pervious material. They shall be of the dimensions and details as indicated on the plans. They shall be classed as "Underdrains," "Foundation Underdrains," "Slope Underdrains" or "Structure Underdrains."

Outlets for underdrains shall consist of pipe laid in a trench and refilled with earth. The size and type of outlet pipe shall be the same as that of the underdrain to which it is connected, except that it shall not be pervious to water.

**7.51.02--Materials: (1) Pipe:** The pipe of underdrains and outlets shall conform to the requirements of Article M.08.01. The kind of pipe to be installed shall be at the option of the Contractor unless a specific type of pipe is indicated on the plans or in the special provisions.

**(2) Aggregates:** The aggregates specified for filling the trench shall meet the requirements of Article M.08.03.

**(3) Joint Sealants:** The materials for sealing and coupling of joints shall conform to the requirements of Article M.08.01.

**(4) Geotextile:** Geotextile shall conform to Subarticle M.08.01-26.

**7.51.03--Construction Methods:** The trench for the underdrain shall be excavated in conformity with the requirements of Article 6.51.03 for pipe culverts. The dimensions of the trench shall be as indicated on the plans or as ordered. Where the bottom of the trench is unstable or in rock, the trench shall be excavated 150 mm deeper and an additional 150 mm layer of granular fill or aggregate similar to that used to fill the trench shall be placed and compacted in the trench.

Where the perforations are to be at the bottom of the pipe, the aggregate for filling the trench shall then be placed to a depth of 75 mm and tamped true to grade. The pipe shall be placed and firmly bedded on the aggregate. This aggregate shall be placed whether the pipe is encased with geotextile or not.

When the pipe used has a bell, the pipe shall be installed with the bell end upgrade with the spigot end entered fully into the adjacent bell.

When clay or concrete pipe is used, the joints will not have to be filled with a joint sealant or fitted with a gasket.

When metal, bituminized fiber, plastic, polyethylene or asbestos cement pipe is used, the pipe shall be carefully butted together and held by bands or other approved means so as to prevent any displacement of the joint.

After the pipe has been installed as described above, the aggregate shall be placed carefully around and over the pipe to a height of 300 mm above the top of the pipe. The remainder of the trench shall be filled with aggregate and tamped in layers as shown on the plans. When the underdrain pipe is used with the holes in an upward position, and in all cases where sand is used instead of the aggregate described hereinbefore, a protective 75 mm minimum layer of Size No. 8 aggregate shall be placed over the pipe and around all of the holes. Geotextile may be substituted for the 75 mm layer of aggregate. When geotextile is used, the entire length of each drain pipe shall be wrapped with the fabric and the seams lapped and welded or bonded. Where the seams of the geotextile are not welded or bonded, they shall be lapped to a minimum width equal to the diameter of the pipe for 150 mm pipe and larger and a minimum of 150 mm for smaller pipe.

In all cases where subbase material or gravel is to be placed over the underdrains, a layer of at least 150 mm of subbase material or gravel shall be placed over the underdrain immediately after its completion.

For outlets, the trench shall be excavated and the pipe installed in conformity with the requirements of Article 6.51.03.

Where shown on the plans or directed by the Engineer, the Contractor shall connect underdrains or outlets to existing or proposed drainage systems or structures.

This work shall be performed in a workmanlike manner satisfactory to the Engineer by installation of tees or wyes branches or by providing a hole in the main line underdrain.

Where the upgrade end of the underdrain does not enter a structure, it shall be capped or plugged as directed.

**7.51.04--Method of Measurement:** This work will be measured for payment by the actual number of meters of underdrains, foundation underdrains, slope underdrains, structure underdrains and outlets for underdrains, completed, accepted and measured in place. Trench excavation will not be measured for payment. Rock-in-trench will be measured for payment in accordance with Article 2.05.04.

**7.51.05--Basis of Payment:** This work will be paid for at the contract unit price per meter for "Underdrain," "Foundation Underdrain," "Slope Underdrain," "Structure Underdrain" and "Outlets for Underdrain" complete in place, which price shall include pipe of the size specified, elbows, tees, wyes, couplings, fitting, trench excavation, geotextile, aggregate, sand, tools, material and labor incidental thereto.

There will be no direct payment made for capping, plugging or connecting underdrains or outlets to existing or proposed drainage systems or structures, but the cost thereof shall be included in the cost of the underdrain items involved.

Rock in trench will be paid for in accordance with Article 2.05.05 at the contract unit price per cubic meter for "Rock in Trench Excavation" of the applying depth.

	Pay Item	Pay Unit
(Size)	Underdrain	m
(Size)	Foundation Underdrain	m
(Size)	Slope Underdrain	m
(Size)	Structure Underdrain	m
(Size)	Outlets for Underdrain	m
(Size-Type)	Underdrain	m
(Size-Type)	Foundation Underdrain	m
(Size-Type)	Slope Underdrain	m
(Size-Type)	Structure Underdrain	m
(Size-Type)	Outlets for Underdrain	m